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A Survey of the Leaf Litter Ant Fauna in Ghana, West Africa (Hymenoptera: Formicidae)

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Abstract.—Leaf litter samples were taken from 34 sites scattered across the moist tropical forest zone in Ghana. They included areas of primary forest, secondary forest and cocoa. Over 40,000 individual ants were extracted using Winkler bags and identified. The species found are listed together with their abundance and a summary of their distribution. A total of 176 species was found (excluding stray workers of arboreal and surface-foraging species), almost two-thirds of which were Myrmicinae. The composition of the fauna is discussed and compared with that found in other tropical forests. The species composition at the different sites showed little variation either between the different forest types or with geographic distance.

INTRODUCTION

In the West African forest belt there has been little quantitative sampling of the ant fauna; studies have been carried out in the Tai Forest Reserve, Côte d'Ivoire (see Lévieux 1982 and included references) and the Réserve de Campo, Cameroun (Halle and Pacal 1992: 65-109). In Ghana there has been no quantitative sampling except in the main tree-crop, cocoa. This has been studied in detail (e.g. Majer 1976 and included references) but the extent to which it resembles the original forest fauna is not known. Nevertheless, this research has led to the taxonomy of West African ants being more advanced than that of most tropical ant faunas (e.g. Bolton 1987 and included references). In consequence we can survey elements of this fauna with the hope of accurately identifying much of it to species.

Ghana has two main terrestrial biomes, savannah and forest, and these have distinct ant faunas. In turn, the forest zone is readily divisible into a canopy and a ground fauna. In this paper we survey the leaf litter element of the forest ground fauna by sampling at different localities across Ghana. In addition to identifying the species present, we discuss the composition of the fauna and compare it with that from other tropical forests. We also examine how the species composition at the sites varies geographically and between the different forest types.

Voucher specimens of all taxa are deposited in the Natural History Museum, London.

METHODS

Sites.—The locations of the sampling sites in Ghana are shown in Figure 1, with brief descriptions and sampling dates given in Table 1. Sites designated by the same letter but with different numbers (e.g. j1 and j2) are within 3km of each other. With one exception, the sites are within the moist semi-deciduous forest zone of Hall and Swaine (1976).

We sampled in a wide range of the forest habitats found in Ghana, including 14 areas of primary forest (in the broad sense of forest with a closed high canopy), 10 areas of secondary forest (of varying age, mostly on agricultural land) and 10 cocoa farms. Sampling was carried out between December 1991 and November 1992.

Sampling.—At each site an area of approximately 1000m^2 was measured out. Within this area ten 1m^2 quadrats were placed at random. All the leaf litter inside a quadrat was collected, shaken through a 1cm sieve, and then left for three days in a Winkler bag. The extracted ants were combined to form a single total for each site, each site being sampled on only one occasion. All sampling was done between 9.30 a.m. and 3.00 p.m.

At three sites (h, q1 and q2) an additional soil sample was taken from each quadrat. This was done by collecting the soil from a 25cm by 25cm quadrat (= 0.0625m^2) to a depth of approximately 5cm. This soil was then sieved and left for three days in Winkler bags in the same manner as the overlying leaf litter.

The Winkler bag (Besuchet *et al.* 1987) operates in a similar fashion to a Berlese Funnel except that the material is left hanging in a mesh bag to dry in air rather than exposed to a heat source. Winkler bags are much cheaper and easier to use and to transport than Berlese Funnels. Litter-sifting followed by extraction in Winkler bags records many species which do not turn up in pitfall traps (Olson 1991). Our extraction period of three days was chosen on the basis of a trial extraction, with daily sorting of a sample over a two week period. We found that within the first three days 86% of the individuals and 88% of the species had emerged.

We ignored winged reproductives and wingless queens found without workers, except in species where the queen is known to forage during nest foundation.

Analyses.—In order to assess the completeness of our survey for the region sampled, i.e. the moist semi-deciduous zone plus disturbed habitats within, we plotted a species accumulation curve. We first arranged the sites in five random sequences. In each sequence we calculated the number of species found at the first site, the first two sites combined, the first three sites combined, and so on. Finally, the mean of the five sequences was calculated. The extent to which the resulting curve flattens out indicates the proportion of the actual fauna which has been recorded; a failure to flatten out indicates that additional species would have been found if the sampling had been continued. Palmer (1990, 1991) compares and tests methods for estimating the species richness of a region from samples taken within it. He concludes that the first-order jacknife is the most precise method, i.e. the one whose estimates are closest to the true value, and we therefore also apply this analysis to our data.

We converted the body lengths of each species to biomass (= dry weight) using the following equation, taken from Gowing and Recher (1984).

$$\mathbf{Log_n\ weight(mg) = -4.0 + 2.5(log_n\ length(mm))}$$

Table 1. Sampling sites with dates and habitat description. Sacred groves are small pieces of forest left in agricultural areas for religious reasons. (Note that Ghanaian place name spellings are often variable.)

a	Sui River Forest Reserve, 1.x.1992, primary forest.
b	Mabang, 18.xii 1991, secondary forest.
c	Tinte Bepo Forest Reserve, 31.iii.1992, primary forest.
d	Mankrang Forest Reserve, 11.iii.1992, primary forest.
e	Poano, 9.ix.1992, cocoa.
f	near Ofinso, 2.xi 1992, cocoa.
g	Jachie, 20.iv.1992, sacred grove (28 acres), primary forest
h	Effiduase, 17.xi.1992, cocoa.
i	Bobiri 1 - 6.iv 1992, Forest Reserve (primary forest); 2 8 iv.1992, Forest Reserve (primary forest but all mature trees killed with sodium arsenide in 1947); 3 - 13.iv.1992, secondary forest (farmland left in 1982 and burnt in 1983).
j	Juaso. 1 - 21.ix.1992, secondary forest (area of Dome River Forest Reserve burnt in 1983); 2 - 23.ix.1992, secondary forest (farmland left for c.20 years); 3 - 8.ix.1992, cocoa
k	Southern Scarp Forest Reserve (North-West of Mpraeso near Osubeng), 23.x.1992, secondary forest (burnt in 1983).
l	Kade. 1 - 6.x.1992, primary forest (in Aiyeola Forest Reserve); 2 - 12.x.1992, secondary forest (farmland left in 1957); 3 - 12.x.1992, cocoa.
m	Esukawkaw Forest Reserve, 27.x.1992, primary forest.
n	Nkawanda (near Nkawkaw), 12.xii.1991, roadside secondary forest
o	Atewa Forest Reserve, primary forest. 1 - 2.iii.1992, near Kibi, 2 - 24.iii.1992, near Potrase; 3 - 26.ii.1992, near Sagymasi (logged in 1970's); 4 - 27.iii.1992, near Sagymasi (logged in 1970's).
p	Asiakwa, 1.v.1992, cocoa.
q	Bunso. 1 - 6.xi.1992, Crops Research Institute arboretum (15 acres), primary forest; 2 - 17.iv.1992, secondary forest (primary forest partially cleared *ca* 20 years previously, left undisturbed for *ca* 12 years); 3 - secondary forest (cocoa left in 1981); 4 - 24.ii.1992, cocoa; 5 - 6.iii.1992, cocoa
r	Old Tafo sacred grove (*ca* 3 acres), 31.i.1992, primary forest.
s	New Tafo (Cocoa Research Institute of Ghana). 1 - 23.xii.1991, secondary forest (farmland left for *ca* 40-50 years); 2 - 11.xii.1991, cocoa.
t	Nankasi, 17.ix.1992, cocoa.

Body lengths (= the outstretched length of a point-mounted worker including mandibles) were taken from the literature or from an average of five specimens. In species with a dimorphic worker caste we did not count major and minor workers separately. Instead we used an estimate of 30:1 for the ratio of minor to major workers in all cases.

To assess the effect of the distance between

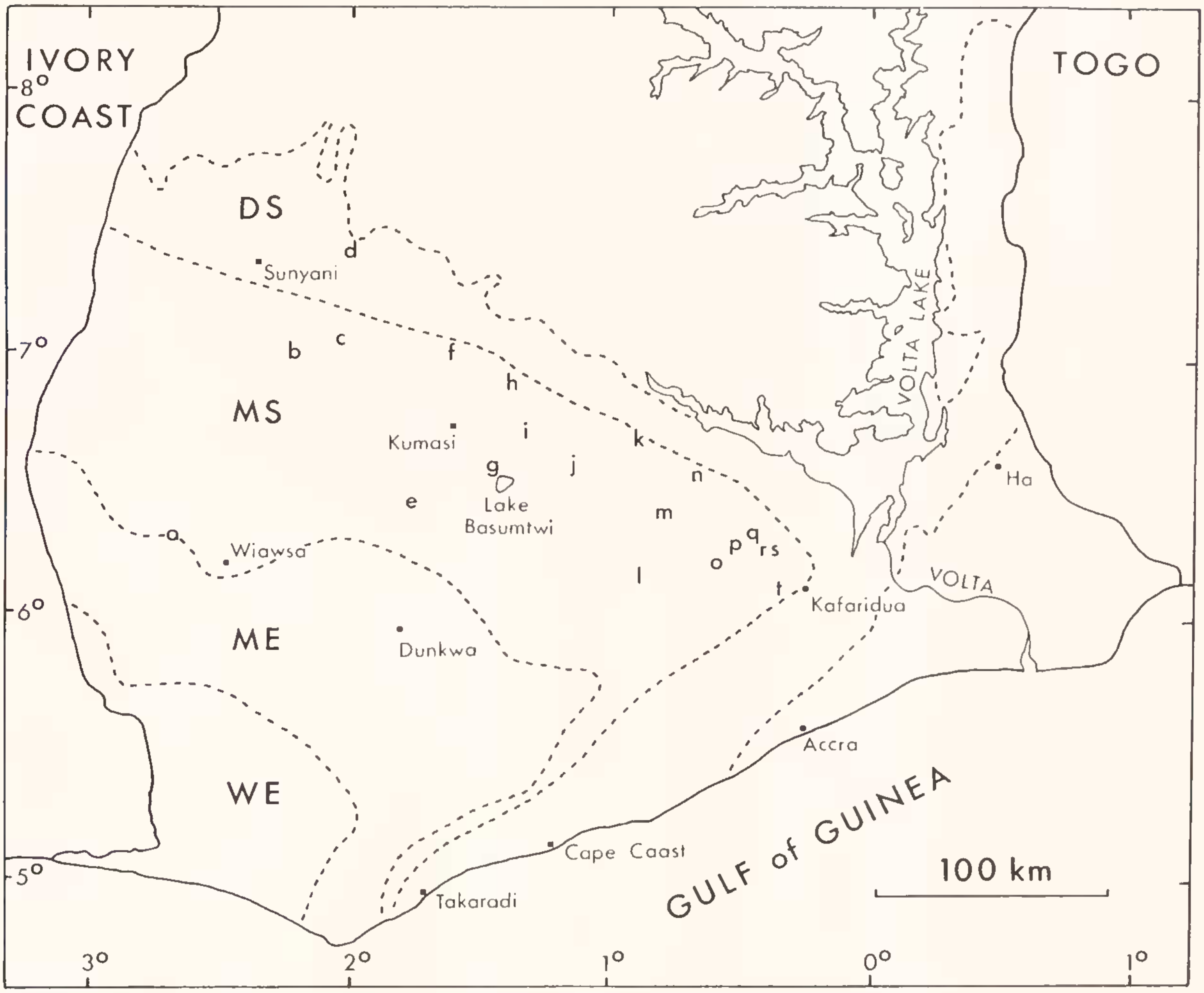

Fig. 1. Map of the forest zone of Ghana showing sampling sites (see table 1 for details). Forest and forest-type boundaries are shown by dotted lines (- - -). Forest-type abbreviations: DS = Dry Semi-deciduous; MS = Moist Semi-deciduous; ME = Moist Evergreen; WE = Wet Evergreen. From Hall and Swaine (1981).

sites on their species composition we first measured the similarity between all possible pairs of sites using the Morisita Index (see Wolda 1981). Their values were then plotted against the logarithm of the distance between the sites, and a regression line fitted. As the data points are not independent, this procedure is of questionable statistical validity; it does, however, allow us to see the general pattern.

RESULTS AND DISCUSSION

We extracted 43,824 ants in 197 species and 47 genera. At least 17 of these species and two of the genera were undescribed (one of these genera is now described in Belshaw and Bolton (1994) and the other is currently being described by Prof. W.L. Brown under the name *Loboponera*). A further 57 species are in groups which lack keys or synthesising taxonomic studies, and we can therefore neither identify them nor recognise them as being undescribed. The species are listed in Table 2, along with the total number of individuals found in each species and a summary of their distribution among the sites.

Of the 197 species recorded, three were only found in the soil samples and a further 18 are known not to forage in the leaf litter and are classed here as tourists. The latter are all arboreal species except for *Camponotus*, which forage on the surface of the ground. Although these tourists comprised 9% of the species found, they comprised only 2% of the total number of individuals.

In the leaf litter the average density of individuals (excluding tourists) was $117m^{-2}$. Using Berlese funnels, other studies have found similar densities of ants in leaf litter: in tropical moist forest on Barro Colorado Island, Panama, in the wet season it was *ca* $200m^{-2}$ (Levings 1983); in temperate deciduous forest in Maryland, U.S.A. between May and September the mean monthly density was $194m^{-2}$ (Lynch and Johnson 1988).

Composition of the fauna.—The relative importance of the different subfamilies in the combined soil and leaf litter samples is shown in Fig. 2.

The fauna is dominated by Myrmicinae. Where their biology is known, the species we found are all generalist predators/scavengers except for most Dacetonini, the workers of which forage singly for Collembola and other soft-bodied arthropods (using highly specialised mandibles), and *Decamorium decem* (Forel), which has been observed attacking termites (Bolton pers. obs.). *Paedalgus distinctus* Bolton and Belshaw has also been found in association with termites (Bolton and Belshaw 1993, see below).

The Ponerinae is the second most important subfamily in our survey. Many ponerines are large ants, so although the subfamily comprises only 8% of the total number of individuals, it comprises 27% of the total biomass. A good example is *Paltothyreus tarsatus* (Fabricius): only 25 individuals of this species were found during the survey, but its contribution to the total ant biomass was exceeded by only two other species. This subfamily contains a high proportion of genera which are specialised predators. In our survey we recorded *Amblyopone* (preys on geophilomorph centipedes), *Plectroctena macgeei* Bolton (other members of the genus prey on millipedes), *Paltothyreus tarsatus* (preys on termites), and *Discothyrea* (preys on arthropod eggs) (all sources in Hölldobler and Wilson 1990: 559).

Driver ants (Aenictinae and Dorylinae) have highly aggregated distributions - their colonies are nomadic and very large (with between 60,000 and 20,000,000 workers in other species (Hölldobler and Wilson 1990: 581)). They are represented in our survey by single workers found at three sites and by almost 1500 workers from one soil quadrat that hit part of a *Dorylus* nest. This group has clearly not been adequately sampled in our survey, and it is probably a much more important component of African forests than our results indicate (see Hölldobler and Wilson 1990: 588).

We found one worker of *Apomyrma stygia* Brown, Gotwald and Lévieux in damp leaf litter a mile inside the Esukawkaw Forest Reserve. This is the sole described species in the Apomyrminae and was recorded previously only from one locality in Côte D'Ivoire (Brown *et al.* 1970), where four nests were found in soil under gallery forest and one under adjacent unburnt savannah. The species is clearly subterranean (the workers are blind), and the remains of a geophilomorph centipede were found in one of the Côte D'Ivoire nests, raising the possiblity that the species specialises on this prey item.

Habitat and geographic variation.—In a separate paper we have investigated in detail the differences in the ant assemblages between the primary forest, secondary forest and cocoa sites in this study (Belshaw and Bolton 1993). We found that they did not differ significantly either in species composition or in species richness. Only two common species show an association with a particular forest type (see Table 2): *Serrastruma lujae* (Forel) was with the exception of a single individual found only in the Esukawkaw and Atewa Forest Reserves, and one *Oligomyrmex* species (sp.indet.4) mostly occurred in cocoa. Given the large number of species present, one would predict that, even if all species were randomly distributed among the three forest types, a handful of such apparent associations would occur purely from chance.

The slope of the regression line in Fig. 4 is very shallow, and the (logarithmically-transformed) distance between sites only accounts for 1.9% of the variation in similarity. The distance between sites therefore had at the most only a slight effect on species composition.

Comparison with other faunas.—Several other studies of tropical forest ant faunas contain lists of leaf litter species: dry forest at Kimberley, N. Australia (Andersen and Majer 1991); moist forest on Barro Colorado Island, Panama (Levings 1983); and dry forest in Madagascar (Olson and Ward, in press). Following elimination of obvious arboreal species, these studies all show the Myrmicinae to be the largest subfamily, followed by the Ponerinae

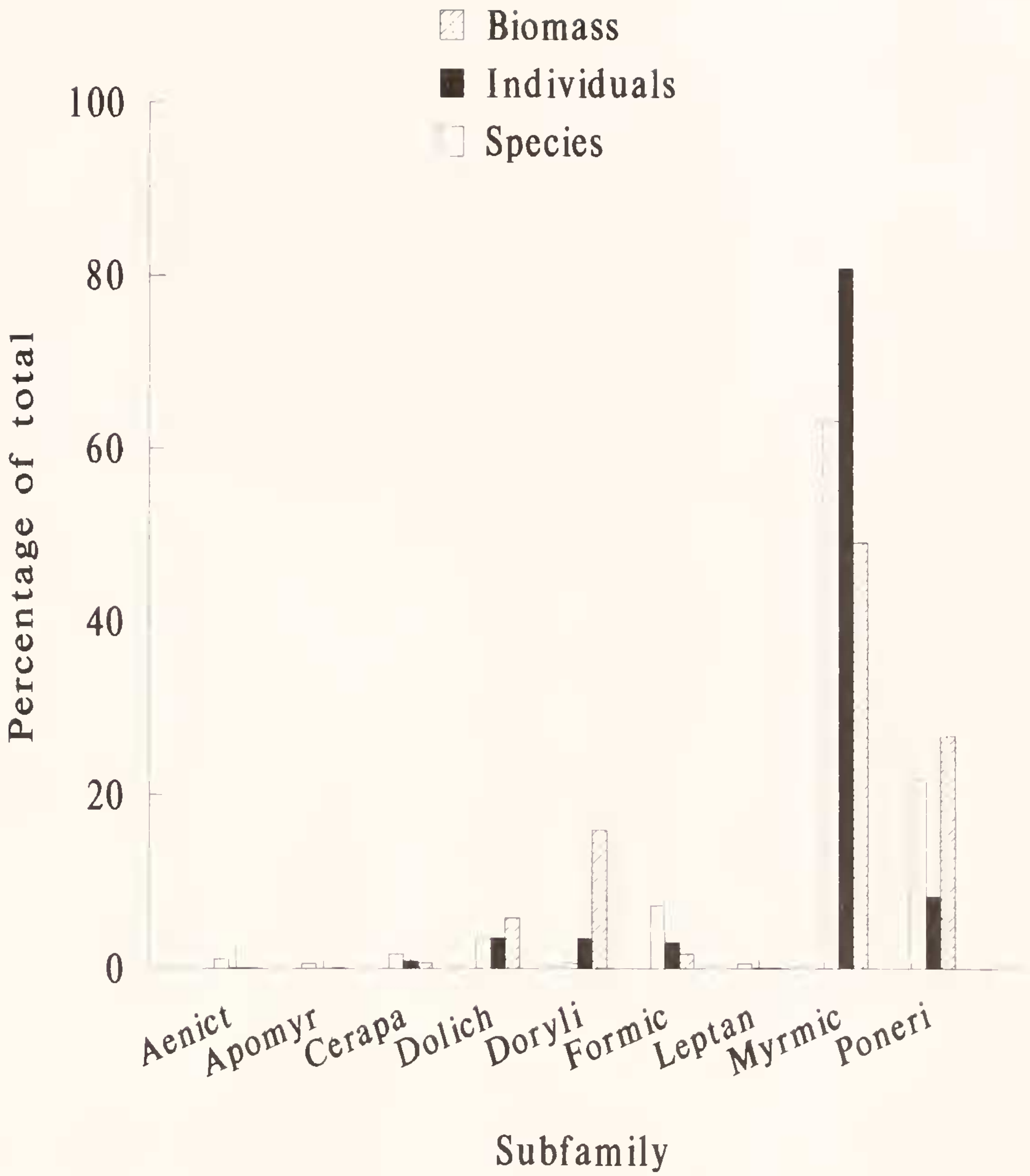

Fig. 2. Relative importance of the different ant subfamilies in the total fauna (leaf litter and soil samples combined, tourists excluded). Names are abbreviated (see table 2).

(in our study comprising 63% and 22% of the total number of species respectively). They comprised 52% and 30% at Kimberley (33 species in total), 65% and 27% on Barro Colorado Island (93 species in total), and 55% and 20% in Madagascar (44 species in total). The figures in the last study would have been higher but for the unusually large number of *Cerapachys* species. The absence of doryline and aenictine ants from the island has possibly permitted diversification in this genus of specialised predators of other ants (Wilson 1971: 68). Unfortunately, it is not possible to compare the species richness of the four areas owing to the differences in sampling area, effort and method (Berlese funnel, Winkler bag and pitfall trapping).

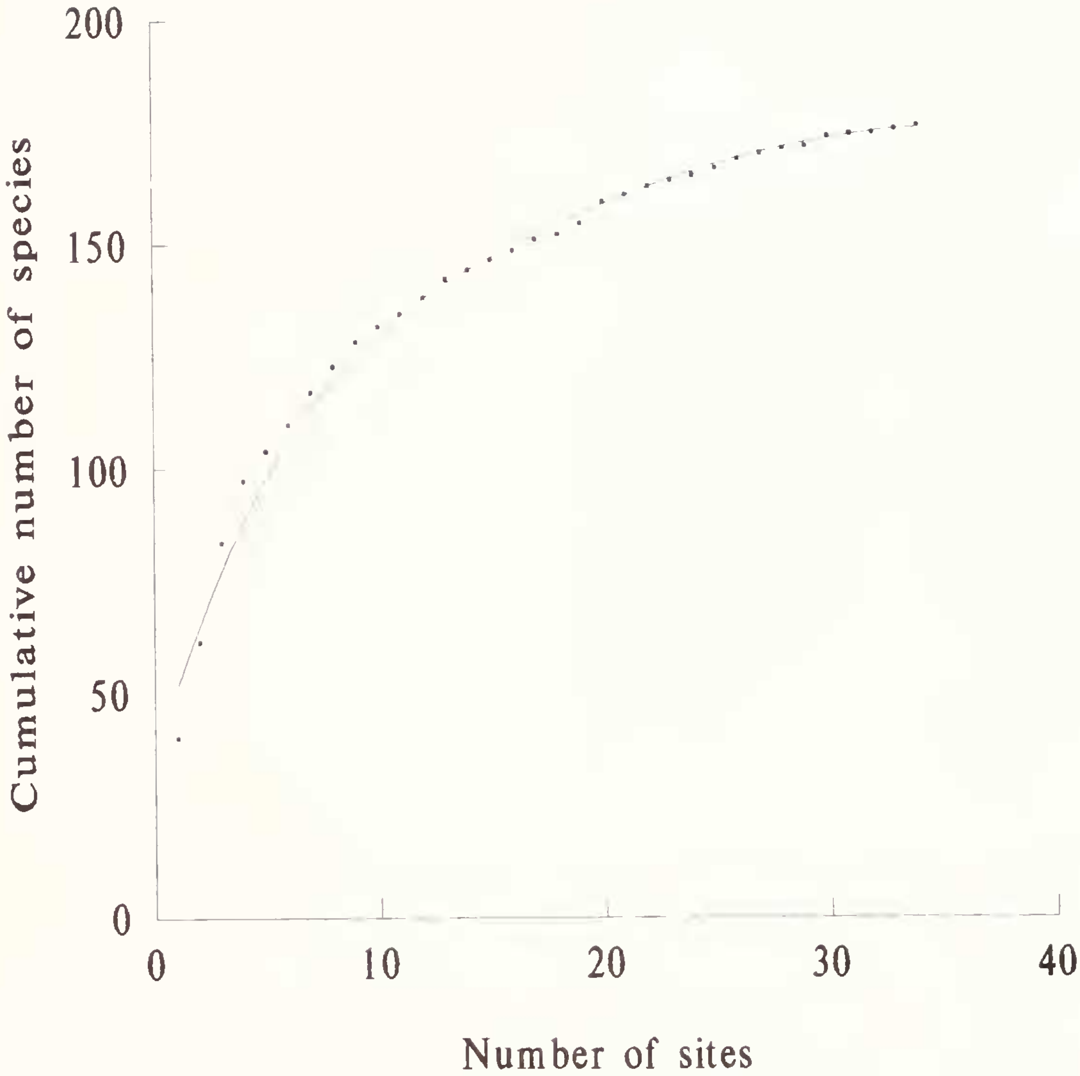

Fig. 3. Species accumulation curve for the leaf litter samples. Line fitted by DWLS smoothing option of computer program SYSTAT (Wilkinson 1990).

Efficiency of survey.—The species accumulation curve is shown in Fig. 3. If the fitted line is extrapolated beyond the data it does not continue to rise. Estimating the true regional species richness using the first-order jacknife method, we find our total of 176 species represents 81% of the actual species present. We infer from this that, within the area of Ghana sampled, we recorded a large majority of the species foraging within leaf litter.

In tropical forests the majority of ground ant species nest in the leaf litter, either in small pieces of rotting wood or between compressed leaves (Wilson 1959; Bolton pers. obs.). In addition, some other species nest in the top 1-2cm of the soil but forage in the leaf litter. However, there are other smaller elements of the ground fauna which, because of their nesting or foraging habits, are likely to have been missed by our sampling method.

1) Completely subterranean species (= ones which nest and forage only in the soil). In Ghana only a few such species are known, e.g. *Plectroctena anops* Bolton and *P. hastifera* (Santschi) (the workers of which are either blind (*anops*) or with very small eyes (*hastifera*)). However, this microhabitat

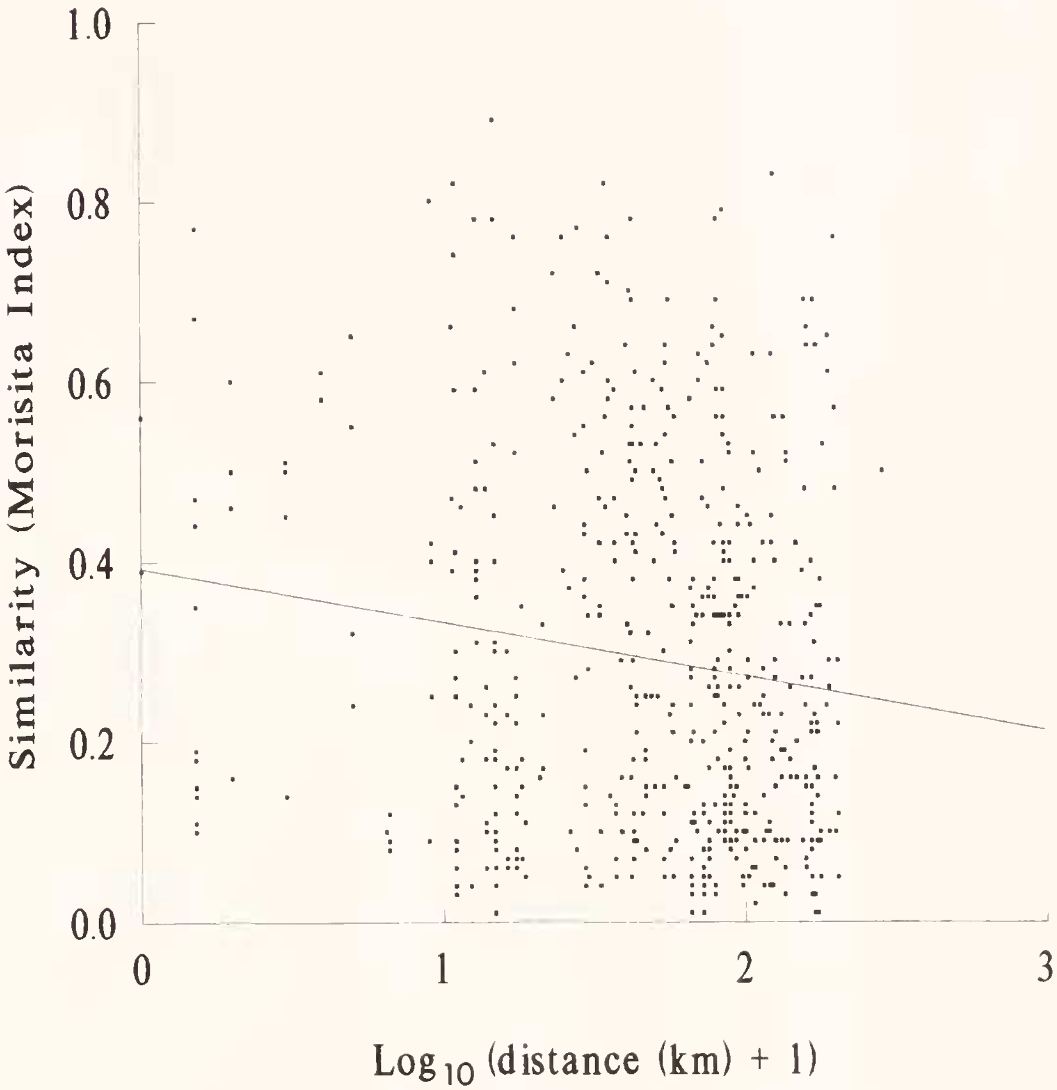

Fig. 4. Plot of similarity in species composition against distance for all possible pairwise comparisons between sites. Line fitted by linear regression ($y = 0.392 - 0.060x$), $r^2 = 0.019$.

has to date hardly been sampled at all, and its fauna is not understood.

2) Species which nest in rotting logs. Such species usually also restrict their foraging to this microhabitat (Wilson 1959). For example, we failed to find *Plectroctena minor* Emery, which is not uncommon in eastern Ghana where it is usually found in or under rotten logs (Bolton 1974). Many Tetramoriini also nest in rotting logs (see Bolton 1980, and below).

3) Obligatory termitolestic species (= species which nest and forage only within termitaria). This is a small group: in Ghana the habit is confirmed only in species of *Carebara* and *Centromyrmex*. We found *Paedalgus distinctus* and *P. saritus* Bolton and Belshaw foraging in leaf litter which indicates that, despite observations on other members of the genus (see Bolton and Belshaw 1993), they do not belong in this group.

4) Species which only forage nocturnally are likely to be under-represented. In Ghana, among the ground fauna, this habit appears to be restricted to species of *Leptogenys* and *Camponotus*. As expected, we found only one of the 12 species

of *Leptogenys* previously recorded from Ghana (Bolton 1975), plus one undescribed species. The genus *Camponotus* is poorly known taxonomically, but there are more than 15 species from Ghana in the collection of the Natural History Museum which we did not find. Non-arboreal members of this genus, although nesting in the soil, are fast-moving surface foragers, which may also have contributed to their poor representation in our survey.

The three largest myrmicine tribes are sufficiently well known taxonomically for us to compare the list of species recorded in our survey with that of species already known from Ghana. In the Dacetonini, 25 species were previously known (Bolton 1983), including two known to be arboreal. We found 18 of the remaining 23 species, plus 14 previously unrecorded in Ghana. In the Solenopsidini, 15 species were known (Bolton 1987), including three savannah species. We found 10 of the remaining 12 species, plus six previously unrecorded. These results show that we have found many small cryptic species which had previously been overlooked. The world-wide household pest *Monomorium pharaonis* (L.) (Pharaoh's Ant) was recorded from nine sites (including primary forest). Its range is clearly not restricted to disturbed habitats in Ghana.

In contrast, we found a smaller proportion of the Tetramoriini species known from Ghana. Previously 53 species were known (Bolton 1976, 1980), including 10 savannah and three arboreal species. We found only 21 of the remaining 40 species, plus six previously unrecorded in Ghana. Members of this tribe, however, often nest in exposed sites or in rotten logs, which may explain its relatively poor representation in our survey.

We cannot compare our results for the Pheidologetonini, Pheidolini or Crematogastrini as no synthesising taxonomic studies have been undertaken. The remaining myrmicine tribes contain a total of 40 species previously recorded from Ghana (Bolton 1981a, 1981b, 1982) including 20 arboreal (chiefly *Cataulacus*), four savannah, and two species which tunnel in living wood (*Melissotarsus*). We found 8 of the remaining 14 species: one of the three *Cardiocondyla*, one of the three *Leptothorax*, two of the four *Calyptomyrmex*, both *Pristomyrmex*, the sole *Meranoplus* and the sole *Baracidris*. In most cases nothing is known of the ecology of the species not found in our survey except for earlier collection localities and dates. However, their absence from our survey shows that they either do not forage in the leaf litter or are rare.

The soil samples.—The density of individuals was eight times higher in the soil samples than in the leaf litter (mean of the three soil samples = 982 m^{-2} (S.E.= 62). Lynch and Johnson (1988) also found that in a temperate forest the density of ants was higher in the soil than the leaf litter. These data may, however, be misleading as in both studies the soil samples probably included species which, although nesting in the top few cm of the soil, forage primarily in the leaf litter.

Although similar in overall species composition to the leaf litter samples (also found by Lynch and Johnson 1988), the three soil samples contained a small distinctive subterranean element. We extracted 30 workers of *Leptanilla boltoni* Baroni Urbani from a single soil quadrat in a small patch of primary forest at Bunso. The sole Afrotropical representative of the genus, it is known previously only from 6 specimens extracted by Berlese funnel from leaf litter in a cocoa plantation at Mampong, Ghana (Baroni Urbani 1977). The genus contains a total of 33 described species, all of which appear to be very rare (Hölldobler and Wilson 1990: 590). The biology of only one species (*L. japonica* Baroni Urbani) is known: it is strictly subterranean and appears to have true legionary behaviour, employing both group predation (of geophilomorph centipedes) and colony migration (Masuko, 1990). Of the 17 individuals of *Acropyga* sp., 10 were found in soil samples. This species resembles others in the genus which tend coccids in subterranean nests for their sugary secretions (Hölldobler and Wilson 1990: 527). It is the only species found in our survey which is known not to be primarily predacious, although the habit probably occurs in species of several other formicine genera (*Pseudolasius*, *Paratrechina* and *Lepisiota*). One of the species of the undescribed Ponerini genus also appeared to be soil-dwelling.

The results of our few soil samples point tantalisingly to a rich and poorly known subterranean fauna that would repay further collecting.

Table 2. Species recorded during the survey (see table 1 for details of sites, and figure 1 for their location). "Widespread" denotes the species was recorded from more than five differently-lettered sites (the number is given in parentheses). An asterisk (*) denotes species classed as tourists (see text).

Species	Total number () = from soil samples	Sites
AENICTINAE		
Aenictus sp. (indet) (1)	1	s1
A. sp. (indet) (2)	1	o3
APOMYRMINAE		
Apomyrma stygia	1	m
CERAPACHYINAE		
Cerapachys foreli	55	widespread (11)
C. nitidulus	299(134)	widespread (12)
C. n.sp.	3	m,o2,s1
DOLICHODERINAE		
Tapinoma sp. (indet.)	2	r
Technomyrmex sp. (indet.) (1)	821(2)	widespread (14)
T. sp. (indet.) (2)	163(8)	widespread (11)
T. sp. (indet.) (3)	3	s1
T. sp. (indet.) (4)	3	d,p
T. sp. (indet.) (5)	530	widespread (10)
DORYLINAE		
Dorylus sp. (indet.)	1477(1468)	l2,q1
FORMICINAE		
CAMPONOTINI		
*Camponotus acvapimensis	2	q4-5
*C. flavomarginatus	15	q4-5,s2
*C. maculatus	2	q5,t
*C. vividus	2	q5
*Polyrhachis decemdentata	2	q4,r
*P. militaris	24	p,q2
*P. rufipalpis	2	a,o4
*P. weissi	1	r
LASIINI		
Paratrechina sp. (indet.) (1)	794	widespread (12)
P. sp. (indet.) (2)	48	d,i3,j1,m,q4-5
P. sp. (indet.) (3)	148(48)	h,i2-3,q2,t
P. sp. (indet.) (4)	1	p
Pseudolasius sp. (indet.)	270(4)	f,i1,o3,q1-3
OECOPHYLLINI		
*Oecophylla longinoda	15	d,i3,j3,p
PLAGIOLEPIDINI		
Acropyga sp. (indet.)	17(10)	a,f,h,q1
Lepisiota sp. (indet.) (1)	4	f,s1
L. sp. (indet.) (2)	2	o3
L. sp. (indet.) (3)	1	o4
L. sp. (indet.) (4)	10	f,q5
L. sp. (indet.) (5)	1	q5
L. sp. (indet.) (6)	1	q5
Plagiolepis sp. (indet.)	19	d
LEPTANILLINAE		
Leptanilla boltoni	30(30)	q1
MYRMICINAE		
CATAULACINI		
*Cataulacus guineensis	1	d
CREMATOGASTRINI		
*Crematogaster depressa	499	widespread (6)
*C. bequaerti	9	o2,p,q2
*C. clariventris	24	p,q4
C. striatula	2210	widespread (13)
*C. sp.(indet.) (1)	1	d
C. sp.(indet.) (2)	1	s2
C. sp.(indet.) (3)	1	o3
C. sp.(indet.) (4)	9	o3
*C. sp.(indet.) (5)	103	i3
DACETONINI		
Epitritus laticeps	27	k,l1-3,m,q4
E. roomi	53(16)	widespread (12)
E. tiglath	9	d,f,k,l1-2
Glamyromyrmex crypturus	57(5)	f,i1,o3,q2-3,s1
G. sistrurus	110	widespread (6)
G. tetragnathus	31	widespread (6)
G. tukultus	20	e,q1
Microdaceton tibialis	53	widespread (7)
Quadristruma emmae	1	n
Serrastruma concolor	238	widespread (8)
S. ludovici	20	g,l2,o2,t
S. lujae	802	j3,m,o1-4
S. serrula	823(4)	widespread (16)
Smithistruma cavinasis	3	l1
S. enkara	7	a,q2

Species	Total number () = from soil samples	Sites
S. fulda	2	a
S. hensekta	58	widespread (9)
S. malaplax	69	s1-2
S. marginata	1	d
S. minkara	55	f,l2,o3,q3
S. ninda	55	f,h,n,q1+5
S. sharra	25	d,f,l1,o2-3
S. tacta	56	widespread (8)
S. tigrilla	9	d,l1,o2
S. n.sp.	4	h,q5
Strumigenys korahyla	1	d
S. nimbrata	70(4)	widespread (7)
S. petiolata	1439(31)	widespread (20)
S. rogeri	177	widespread (6)
S. rufobrunea	1059	widespread (15)
S. spathoda	1(1)	q2
S. vazerka	22(1)	a,l3,o2,q1+3,s2
FORMICOXENINI		
Cardiocondyla neferka	1	d
Leptothorax angulatus	1	q5
*Tetrataner piceus	1	n
MERANOPLINI		
Meranoplus inermis	1	s1
MYRMECININI		
Pristomyrmex africanus	79(3)	widespread (9)
P. orbiceps	505(3)	widespread (13)
PHEIDOLOGETONINI		
Afroxyidris crigensis	2	e,f
Oligomyrmex sp. (indet.) (1)	440(7)	widespread (10)
O. sp. (indet.) (2)	1957(333)	widespread (15)
O. sp. (indet.) (3)	1532(175)	widespread (12)
O. sp. (indet.) (4)	123(10)	e,j3,l3,q2+5,s2,t
O. sp. (indet.) (5)	245	widespread (6)
O. sp. (indet.) (6)	967(81)	widespread (13)
O. sp. (indet.) (7)	98(92)	q1-2+5
O. sp. (indet.) (8)	602	widespread (6)
O. sp. (indet.) (9)	156(34)	q1,o3
O. sp. (indet.) (10)	197	g,j1+3,m
O. sp. (indet.) (11)	39(27)	h
O. sp. (indet.) (12)	104	l1-3,q3
Paedalgus distinctus	228(22)	widespread (13)
P. saritus	42	j3,n,o2
PHEIDOLINI		
Pheidole sp. (indet.) (1)	778	widespread (10)
P. sp. (indet.) (2)	5474(99)	widespread (20)

Species	Total number () = from soil samples	Sites
P. sp. (indet.) (3)	180(74)	d,g,i2,p,q2
P. sp. (indet.) (4)	67	d,q5,s2
P. sp. (indet.) (5)	213(1)	widespread (9)
P. sp. (indet.) (6)	10	a,o4,p,t
P. sp. (indet.) (7)	98	o4
P. sp. (indet.) (8)	8	o1,h
P. sp. (indet.) (9)	496	widespread (7)
P. sp .(indet.) (10)	74	e,i3,q4
P. sp .(indet.) (11)	30	a
SOLENOPSIDINI		
Monomorium bicolor	1	d
M. cryptobium	1475(242)	widespread (16)
M. draxocum	5	d,g
M. exiguum	605	widespread (16)
M. floricola	13	l3
M. egens	8	widespread (7)
M. gabrielense	42	a,b,g,o2-3,t
M. guineense	55	g,i2
M. invidium	3432(62)	widespread (19)
M. pharaonis	17	widespread (6)
M. rosae	7	f,q4-5
M. tanysum	2	d
M. trake	10	d,i2
M. n.sp. (1)	22	d
M. n.sp. (2) (exiguum group)	13	p,q5
M. n.sp. (3)	75	i2,j1+3,p
STENAMMINI		
Baracidris meketra	8(3)	j3,l2,m,n,q1-2
Calyptomyrmex kaurus	18	k,l1-2,o3
C. nummuliticus	11	l2,o3,p,q3
TETRAMORIINI		
Decamorium decem	119	widespread (7)
*Tetramorium aculeatum	3	o1+4,i3
T. amentete	106	widespread (8)
T. antrema	162	widespread (10)
T. ataxium	140(4)	widespread (11)
T. brevispinosum	118	widespread (6)
T. camerunense	2	o1
T. distinctum	552(16)	widespread (16)
T. flavithorax	350	widespread (17)
T. furtivum	689(33)	widespread (8)
T. guineense	417	widespread (10)
T. ictidum	1	o2
T. invictum	65	widespread (6)
T. jugatum	4	d,l2,t
T. lucayanum	3	e,l3
T. menkaura	21	d,o2-4,s1,t

Species	Total number () = from soil samples	Sites
T. minimum	368(25)	widespread (15)
T. muralti	189	widespread (10)
T. muscorum	18	widespread (6)
T. peutli	28	widespread (6)
T. quadridentatum	1	q4
T. rhetidum	971(6)	widespread (9)
T. youngi	7	o2-3
T. zambesium	2293(13)	widespread (17)
T. zapyrum	33	d,r,t
T. n.sp. (weitzeckeri group)	30	l1,o4,q2
T. n.sp. (convexum group)	5	i3,m
T. n.sp. (dumezi group)	2	q3
PONERINAE		
AMBLYOPONINI		
Amblyopone mutica	3	i2,t
A. santschii	6	f,g,j1+3,q1
ECTATOMMINI		
Discothyrea oculata	1	q2
D. mixta	3	f,l1,o4
D. n.sp (1)	5(1)	f,l1,o4,q1
D. n.sp (2)	3	a
PLATYTHYREINI		
*Platythyrea conradti	1	r
Probolomyrmex guineensis	46	f,k,l1-3,s1
PONERINI		
Anochetus africanus	170	g,l1-3,o1+3-4,p,q1-3
A. bequaerti	43(2)	widespread (9)
A. katonae	568(70)	widespread (17)
A. maynei	1	s1
A. siphneus	6	f,h,j3,t
A. n.sp.	4	o3-4
Asphinctopone silvestrii	5(1)	f,q1-3
Cryptopone n.sp.	2	j1
Hypoponera sp. (indet.) (1)	244(29)	widespread (13)
H. sp. (indet.) (2)	1828(35)	widespread (19)
H. sp. (indet.) (3)	11	d,g,k
H. sp. (indet.) (4)	98(16)	widespread (6)
H. sp. (indet.) (5)	223(2)	widespread (9)
H. sp. (indet.) (6)	6(1)	i3,o1,q2
Leptogenys nuserra	15(1)	l3,m,o1-2,q2,t
L. n.sp.	1	o2
Odontomachus assiniensis	8	s1
O. troglodytes	22	widespread (7)
Pachycondyla ambigua	24	a,d,f,l2,o1-2+4
P. brunoi	24(9)	widespread (8)
P. caffraria	86	widespread (8)
P. fugax	12	h,i1,l2,o3,t
P. pachyderma	16	widespread (7)
P. soror	2	l3,q2
P. sp. (indet.)	18(7)	p,q1+3,s1
P. n.sp.	1	i3
Paltothyreus tarsatus	25	widespread (7)
Phrynoponera bequaerti	13	l1+3
P. gabonensis	24(1)	widespread (6)
Plectroctena macgeei	3	j1,o3
n.gen.,n.sp. (1)	3(3)	q2,h
n.gen.,n.sp. (2)	1	l3

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